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FILE 'HOME' ENTERED AT 13:40:23 ON 14 JUL 2000

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=> s (non-interlink?) or (non interlink?) or (noninterlink?)

L5           0 (NON-INTERLINK?) OR (NON INTERLINK?) OR (NONINTERLINK?)

=> s bioactive

L6       10961 BIOACTIVE

=> s bioactive glass

L7         321 BIOACTIVE GLASS

=> s l7 (s) particl?

L8          40 L7 (S) PARTICL?

=> s l8 and (non-interlink?)

L9           0 L8 AND (NON-INTERLINK?)

=> s l8 and (dressing or wound)

L10          3 L8 AND (DRESSING OR WOUND)

=> s l8 and (na or sodium or ca or calcium or p or phosphours)

L11         20 L8 AND (NA OR SODIUM OR CA OR CALCIUM OR P OR PHOSPHOURS)

=> d l11 ibib abs 1-11


L11  ANSWER 1 OF 20  MEDLINE
ACCESSION NUMBER:    2000179034     MEDLINE
DOCUMENT NUMBER:     20179034
TITLE:               Assessment of resorbable bioactive material for grafting
of
                     critical-size cancellous defects.
AUTHOR:              Wheeler D L; Eschbach E J; Hoellrich R G; Montfort M J;
                     Chamberland D L
CORPORATE SOURCE:    Department of Orthopaedics, University of Florida,
                     Gainesville 32610, USA.. wheelerd@ortho.ufl.edu
SOURCE:              JOURNAL OF ORTHOPAEDIC RESEARCH, (2000 Jan) 18 (1) 140-8.

                     Journal code: JIQ. ISSN: 0736-0266.
PUB. COUNTRY:        United States
                     Journal; Article; (JOURNAL ARTICLE)
LANGUAGE:            English
FILE SEGMENT:        Priority Journals
ENTRY MONTH:         200005
ENTRY WEEK:          20000504
AB   Bioactive glasses form a surface apatite layer in vivo that enhances the
     formation and attachment of bone. Sol-gel Bioglass graft material
provides
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greater nanoscale porosity than **bioactive glass** (on the order of 50-200 A), greater **particle** surface area, and improved resorbability, while maintaining bioactivity. This study histologically and biomechanically evaluated, in a rabbit model, bone formed within critical-sized distal femoral cancellous bone defects filled with 45S5 Bioglass particulates, 77S sol-gel Bioglass, or 58S sol-gel Bioglass and compared the bone in these defects with normal, intact, untreated cancellous bone and with unfilled defects at 4, 8, and 12 weeks. All grafted defects had more bone within the area than did unfilled controls (**p** < 0.05). The percentage of bone within the defect was significantly greater for the 45S5 material than for the 58S or 77S material at 4 and 8 weeks (**p** < 0.05), yet by 12 weeks equivalent amounts of bone were observed for all materials. By 12 weeks, all grafted defects were equivalent to the normal untreated bone. The resorption of 77S and 58S **particles** was significantly greater than that of 45S5 **particles** (**p** < 0.05). Mechanically, the grafted defects had compressive stiffness equivalent to that of normal bone at 4 and 8 weeks. At 12 weeks, 45S5-grafted defects had significantly greater stiffness (**p** < 0.05). At 8 and 12 weeks, all grafted defects had significantly greater stiffness than unfilled control defects (**p** < 0.05). In general, the 45S5-filled defects exhibited greater early bone ingrowth than did those filled with 58S or 77S. However, by 12 weeks, the bone ingrowth in each defect was equivalent to each other and to normal bone. The 58S and 77S materials resorbed faster than the 45S5 materials. Mechanically, the compressive characteristics of all grafted defects were equivalent or greater than those of normal bone at all time points.

L11 ANSWER 2 OF 20 MEDLINE
ACCESSION NUMBER: 2000096253 MEDLINE
DOCUMENT NUMBER: 20096253
TITLE: **Bioactive glass** coatings with hydroxyapatite and Bioglass **particles** on Ti-based implants. 1. Processing.
AUTHOR: Gomez-Vega J M; Saiz E; Tomsia A P; Marshall G W; Marshall S J
CORPORATE SOURCE: Materials Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA.
CONTRACT NUMBER: 1R01DE11289 (NIDCR)
SOURCE: BIOMATERIALS, (2000 Jan) 21 (2) 105-11.
Journal code: A4P. ISSN: 0142-9612.
PUB. COUNTRY: ENGLAND: United Kingdom
Journal; Article; (JOURNAL ARTICLE)
LANGUAGE: English
FILE SEGMENT: Priority Journals
ENTRY MONTH: 200005
ENTRY WEEK: 20000502

AB Silicate-based glasses with thermal expansion coefficients that match those of Ti6A14V were prepared and used to coat Ti6A14V by a simple enameling technique. Bioglass (BG) or hydroxyapatite (HA) particles were embedded on the coatings in order to enhance their bioactivity. HA particles were immersed partially during heating and remained firmly embedded on the coating after cooling. There was no apparent reaction at the glass/HA interface at the temperatures used in this work (800-840 degrees C). In contrast, BG particles softened and some infiltration into the glass coating took place during heat treatment. In this case, particles with sizes over 45 microm were required, otherwise the particles

became hollow due to the infiltration and crystallization of the glass surface. The concentration of the particles on the coating was limited to 20% of surface coverage. Concentrations above this value resulted in cracked coatings due to excessive induced stress. Cracks did not propagate along the interfaces when coatings were subjected to Vickers indentation tests, indicating that the particle/glass and glass/metal interfaces exhibited strong bonds. Enameling, producing excellent glass/metal adhesion with well-attached bioactive particles on the surface, is a promising method of forming reliable and lasting implants which can endure substantial chemical and mechanical stresses.

L11 ANSWER 3 OF 20 MEDLINE
ACCESSION NUMBER: 2000040313 MEDLINE
DOCUMENT NUMBER: 20040313
TITLE: In vitro transformation of bioactive glass granules into **Ca-P** shells.
AUTHOR: Radin S; Ducheyne P; Falaize S; Hammond A
CORPORATE SOURCE: University of Pennsylvania, Center for Bioactive Materials and Tissue Engineering, Department of Bioengineering, 3320 Smith Walk, Philadelphia, Pennsylvania 19104, USA.
CONTRACT NUMBER: DE-10693 (NIDCR)
SOURCE: JOURNAL OF BIOMEDICAL MATERIALS RESEARCH, (2000 Feb) 49 (2) 264-72.
Journal code: HJJ. ISSN: 0021-9304.
PUB. COUNTRY: United States
Journal; Article; (JOURNAL ARTICLE)
LANGUAGE: English
FILE SEGMENT: Priority Journals
ENTRY MONTH: 200004
ENTRY WEEK: 20000403

AB **Bioactive glass** (BG) granules of narrow size are excavated when implanted in mandibular bone of beagles. Bone tissue forms within these internally hollowed **particles** without a connection to the bone at the margins of the defect. In this study the internal excavation of BG granules was simulated by in vitro immersion experiments.

Postimmersion solutions were analyzed for changes in Si, **Ca**, and **P** concentrations. Using scanning electron microscopy (SEM), energy dispersive X-ray (EDX) analysis and Fourier Transform Infrared (FTIR) spectroscopy, granules were analyzed for compositional, morphologic, and structural changes resulting from immersion. Only when the solution was continuously replenished and only if this solution was composed of electrolyte- and protein-containing serum was excavation achieved. Without solution replenishment, that is, under so-called integral immersion conditions, the solution quickly became saturated in silicon, and the silicon no longer dissolved. When the glass was immersed in a solution with serum, a porous surface structure with fine precipitates was formed, in contrast to a dense surface reaction layer with closely packed globular precipitates that was formed in a solution without serum. The combined effect of continuous solution replenishment and the use of a solution containing serum proteins led to the formation of a surface reaction layer that did not impede continued corrosion. As such, all Si was released, and

eventually a hollow **Ca-P** shell was formed. Thus this study supports the hypothesis that there is a physico-chemical mechanism of Si transport through the **Ca-P**-rich layer followed by Si dissolution. This mechanism may be operative in vivo and thereby may contribute to the observed in vivo excavation. Copyright 2000 John Wiley & Sons, Inc.

L11 ANSWER 4 OF 20 MEDLINE
ACCESSION NUMBER: 1999294523 MEDLINE
DOCUMENT NUMBER: 99294523
TITLE: Comparison of bioactive glass to demineralized freeze-dried bone allograft in the treatment of intrabony defects around implants in the canine mandible.
AUTHOR: Hall E E; Meffert R M; Hermann J S; Mellonig J T; Cochran D L
CORPORATE SOURCE: Department of Periodontics, University of Texas Health Science Center, San Antonio 78440, USA.
SOURCE: JOURNAL OF PERIODONTOLOGY, (1999 May) 70 (5) 526-35. Journal code: JMT. ISSN: 0022-3492.
PUB. COUNTRY: United States
Journal; Article; (JOURNAL ARTICLE)
LANGUAGE: English
FILE SEGMENT: Priority Journals; Dental Journals
ENTRY MONTH: 199909
ENTRY WEEK: 19990905
AB BACKGROUND: The purpose of this study was to evaluate and compare the healing of different bone grafting materials adjacent to titanium plasma-sprayed (TPS) endosseous dental implants. METHODS: Implant osteotomy sites were prepared and standardized 3-walled intrabony defects (3 mm x 5 mm x 5 mm) were created at the mesial of each implant site. Thirty-two TPS implants were placed in edentulous mandibular ridges of the 4 dogs. Periodontal dressings were placed in the defect sites so as to create a defect simulating bone loss around an implant. After 3 months, the periodontal dressing was removed, the defect sites debrided and evaluated for size, and intramarrow penetration performed. The graft materials tested were 1) canine demineralized freeze-dried bone allograft (cDFDBA); 2) **bioactive glass** granules of a broad size range 90 to 710 microns (BRG); and 3) **bioactive glass** granules of narrow size range 300 to 355 microns (NRG). One site on each side of the mandible was not filled and served as a control. Dogs were sacrificed 4 months after graft placement. RESULTS: Histologically, differences in percent bone-to-implant contact in the defect area were observed between the treatment groups. cDFDBA>control=BRG=NRG with statistical significance found between cDFDBA and control (**P** = 0.0379), but no statistically significant difference between control or either **bioactive glass** material. When comparing percent bone height fill of the defect in the grafted area, cDFDBA (65.7%) was significantly better than the control (48.9%; **P** < or = 0.05) with no statistically significant difference between control, broad range **bioactive glass** (57.3%) and narrow range **bioactive glass** (56.6%). When total bone area was measured, the percentage of new bone in the grafted area was cDFDBA

(42.1%), broad range glass (33.1%) and narrow range glass (22.6%) with significance found between cDFDBA and NRG (**P** = 0.0102). The content of residual graft **particles** in soft tissue was significant (**P** = 0.0304) between cDFDBA (1.4%) and NRG (11.4%) with no significant difference between graft material for residual **particle** content in bone tissue. CONCLUSIONS: The results of this study indicate that percent bone-to-implant contact and percent bone height fill in an intrabony defect around titanium plasma-sprayed implants are statistically significantly higher with the use of DFDBA when compared to **bioactive glass** material.

L11 ANSWER 5 OF 20 MEDLINE
ACCESSION NUMBER: 1999237906 MEDLINE
DOCUMENT NUMBER: 99237906
TITLE: In vivo comparison of synthetic osseous graft materials. A preliminary study.
AUTHOR: MacNeill S R; Cobb C M; Rapley J W; Glaros A G; Spencer P
CORPORATE SOURCE: Department of Periodontics, School of Dentistry, University of Missouri-Kansas City, 64108, USA.. macneills@umkc.edu
SOURCE: JOURNAL OF CLINICAL PERIODONTOLOGY, (1999 Apr) 26 (4) 239-45.
Journal code: HT7. ISSN: 0303-6979.
PUB. COUNTRY: Denmark
Journal; Article; (JOURNAL ARTICLE)
LANGUAGE: English
FILE SEGMENT: Priority Journals; Dental Journals
ENTRY MONTH: 199908
ENTRY WEEK: 19990802
AB The purpose of this study was to compare the in vivo osseous healing response of 4 commercially-available synthetic bone grafting materials; hydroxylapatite (HA), **calcium** sulfate (CaSO4) plus autogenous bone, or a **bioactive glass** ceramic: with **particle** size of 300-360 microm (BG1) or 90 to 710 microm (BG2). 4 osteotomy sites were prepared in each tibia of 10 adult male rabbits. One unfilled osteotomy site served as negative control (NC) and another site filled with autogenous bone was the positive control (PC). All animals received BG1 in 2 sites and BG2 in 2 sites. 5 animals received HA and five CaSO4 plus autogenous bone in the remaining 2 sites. Animals were sacrificed at 28 days post-surgery, histologic sections obtained and the % surface area of new bone formation for each material was determined by computerized image analysis. All graft sites showed evidence of bone formation, i.e., (NC) 41.95%; (PC) 50.41%; (BG1) 41.82%; (BG2) 40.36%; (HA) 41.83% and (CaSO4) 58.83%. Statistical analysis using an ANOVA with repeated measures on the materials common to all animals (excluding HA and CaSO4 groups) showed significant differences between materials in surface area of bone, with positive controls better than negative controls, and BG1 and BG2 not significantly different from the negative control. These results indicate that synthetic graft materials can support new bone formation in surgically prepared defects. The utility of a rabbit model for studying physiologic osseous turnover and healing is questioned for studies of slowly resorbing synthetic graft materials.

L11 ANSWER 6 OF 20 MEDLINE

ACCESSION NUMBER: 1998362350 MEDLINE
DOCUMENT NUMBER: 98362350
TITLE: Effect of **bioactive glass** **particle** size on osseous regeneration of cancellous defects [see comments].
COMMENT: Comment in: J Biomed Mater Res 1999 Aug;46(2):301-4
AUTHOR: Wheeler D L; Stokes K E; Hoellrich R G; Chamberland D L; McLoughlin S W
CORPORATE SOURCE: Orthopaedic Research Laboratory, Oregon Health Sciences University, Portland 97201, USA.
SOURCE: JOURNAL OF BIOMEDICAL MATERIALS RESEARCH, (1998 Sep 15) 41 (4) 527-33.
Journal code: HJJ. ISSN: 0021-9304.
PUB. COUNTRY: United States
Journal; Article; (JOURNAL ARTICLE)
LANGUAGE: English
FILE SEGMENT: Priority Journals
ENTRY MONTH: 199901

AB The **bioactive glass** known as Bioglass or Perioglass (USB) (US Biomaterials, Alachua, FL) has proven to be an effective graft material owing to the apatite layer which forms on the surface of the glass, promoting bone formation. USB **particles** range in size from 90 to 710 microns in diameter, as determined by optical microscopy. A similar bioactive material, BioGran (OV) (Orthovita, Malvern, PA), was developed to limit the **particle** size of 4555 to the range between 300 and 360 microns, as determined by sieving. The objective of this study was to histologically and biomechanically compare the 4555 **bioactive glass**, produced by US Biomaterials, in a wide **particle** range (USB) to the narrower **particle** range glass produced by Orthovita (OV) The grafted defects will then be compared to normal cancellous bone (NORM) of the distal femur in rabbits. Histologically, more bone was quantified at both 4 and 12 weeks within the defects filled with USB and NORM when compared to the limbs filled with OV ($p < 0.05$). The OV **particles** had greater **particle** axes and larger **particle** areas on average than the USB **particles** ($p < 0.05$). However, the **particle** axis and area of the two materials decreased with time at a similar rate. Biomechanically, the USB- and OV-grafted defects had comparable peak compressive load, compressive stiffness, and compressive modulus which were equivalent to normal bone.

L11 ANSWER 7 OF 20 MEDLINE
ACCESSION NUMBER: 1998321776 MEDLINE
DOCUMENT NUMBER: 98321776
TITLE: Comparison of **bioactive glass** synthetic bone graft **particles** and open debridement in the treatment of human periodontal defects. A clinical study.
AUTHOR: Froum S J; Weinberg M A; Tarnow D
CORPORATE SOURCE: New York University, Department of Implant Dentistry, New York, USA.
SOURCE: JOURNAL OF PERIODONTOLOGY, (1998 Jun) 69 (6) 698-709.
Journal code: JMT. ISSN: 0022-3492.
PUB. COUNTRY: United States
(CLINICAL TRIAL)
Journal; Article; (JOURNAL ARTICLE)

(RANDOMIZED CONTROLLED TRIAL)
LANGUAGE: English
FILE SEGMENT: Priority Journals; Dental Journals
ENTRY MONTH: 199811
ENTRY WEEK: 19981103
AB The purpose of this study was to compare the repair response of **bioactive glass** synthetic bone graft **particles** and open debridement in the treatment of human periodontal osseous defects. Fifty-nine defects in 16 healthy adults were selected. Each patient had at least 2 sites with attachment loss of at least 6 mm with clinical and radiographic evidence of intrabony or furcation defects. One to 3 months after cause-related therapy (oral hygiene instructions, scaling and root planing), the following measurements were recorded prior to surgery: probing depths, clinical attachment level, and gingival recession. Each defect was surgically exposed and measurements made of the alveolar crest height and base of osseous defect. The test defects were implanted with **bioactive glass**. The other sites served as unimplanted controls. Flaps were sutured at or close to the presurgical level. Radiographs and soft tissue presurgical measurements were repeated at 6, 9, and 12 months. At 12 months all sites were surgically re-entered to record osseous measurements. At the 12-month evaluation, significantly greater mean probing depth reduction was noted in the **bioactive glass** group compared to the controls (4.26 mm versus 3.44 mm; **P** = 0.028). Clinical attachment level gain was significantly improved (**P** = 0.0004) in the **bioactive glass** sites (2.96 mm) compared to the control sites (1.54 mm). There was significantly less gingival recession in the **bioactive glass** sites (1.29 mm) compared to the control sites (1.87 mm). Defect fill was significantly greater in the **bioactive glass** sites (3.28 mm) compared to the control sites (1.45 mm). Defect depth reduction was significantly greater in the **bioactive glass** sites (4.36 mm) compared to the control sites (3.15 mm). In conclusion, **bioactive glass** showed significant improvement in clinical parameters compared to open flap debridement.

L11 ANSWER 8 OF 20 MEDLINE
ACCESSION NUMBER: 97278138 MEDLINE
DOCUMENT NUMBER: 97278138
TITLE: **Bioactive glass particles** of narrow size range for the treatment of oral bone defects: a 1-24 month experiment with several materials and **particle** sizes and size ranges.
AUTHOR: Schepers E J; Ducheyne P
CORPORATE SOURCE: Department of Prosthetic Dentistry, University of Leuven, Belgium.
SOURCE: JOURNAL OF ORAL REHABILITATION, (1997 Mar) 24 (3) 171-81.

Journal code: JIE. ISSN: 0305-182X.
PUB. COUNTRY: ENGLAND: United Kingdom
Journal; Article; (JOURNAL ARTICLE)
LANGUAGE: English
FILE SEGMENT: Priority Journals; Dental Journals
ENTRY MONTH: 199709
AB The aim of this study was to evaluate bone growth around **bioactive glass particles** in bone defects in comparison to hydroxylapatite **particles**. The **bioactive glass**

particles were implanted in the partial edentulous jaws of Beagle dogs in two different compositions and several sizes and size ranges. After 1, 2, 3, 6, 12 and 24 months the samples were harvested and processed for undecalcified sectioning. Histological analysis showed a superior response of the **bioactive glass** **particles** of composition A and narrow size range (300-355 microns). Besides extensive osteoconductive properties, the bone repair was also stimulated by bone growth in the internally eroded **particles**. The data demonstrate conclusively that the well known corrosion reactions of the **bioactive glass** lead to the formation of protective pouches. In these protective pouches formation of new bone is detected without this bone being connected to the bone tissue outside the **particles**. These islands of newly formed bone tissue function as nuclei for further bone growth and enhance the repair of the defect.

L11 ANSWER 9 OF 20 MEDLINE
ACCESSION NUMBER: 95202605 MEDLINE
DOCUMENT NUMBER: 95202605
TITLE: Bioactive glass-ceramic containing crystalline apatite and wollastonite initiates biomineralization in bone cell cultures.
AUTHOR: Sautier J M; Kokubo T; Ohtsuki T; Nefussi J R; Boulekbache H; Oboeuf M; Loty S; Loty C; Forest N
CORPORATE SOURCE: Laboratoire de Biologie-Odontologie, Universite Paris VII, France..
SOURCE: CALCIFIED TISSUE INTERNATIONAL, (1994 Dec) 55 (6) 458-66.

Journal code: CGH. ISSN: 0171-967X.
PUB. COUNTRY: United States
Journal; Article; (JOURNAL ARTICLE)
LANGUAGE: English
FILE SEGMENT: Priority Journals
ENTRY MONTH: 199506
AB Rat bone cells were cultured in the presence of **bioactive** **glass**-ceramic containing crystalline apatite and wollastonite. Scanning electron microscopy observations of the surface of the seeded ceramic disks revealed that cells attached, spread, and proliferated on the material surface. Soaking in cell-free culture medium showed that no change occurred in the surface structure. However, when cultured with bone cells and observed under a transmission electron microscope, an electron-dense layer was noted initially at the surface of the material, before bone formation occurred. In addition, energy-dispersive X-ray microanalysis demonstrated the presence of **calcium** and phosphorus in this layer. Progressively, during the following days of culture, active osteoblasts synthetized and laid down an osteoid matrix composed of numerous collagen fibrils arranged either parallel or perpendicularly to the first-formed electron-dense layer. Mineralization initiated on the ceramic surface dispersed then along the collagenous fibrils, leading to a mineralized matrix which surrounded the ceramic **particles**. These results demonstrate the capacity of apatite-wollastonite glass ceramic to initiate biomineralization in osteoblast cultures and to achieve a direct bond between the surface apatite layer of the **bioactive glass**-ceramic and the mineralized bone matrix.

L11 ANSWER 10 OF 20 MEDLINE
ACCESSION NUMBER: 95074199 MEDLINE

DOCUMENT NUMBER: 95074199
TITLE: Numerical analysis of extracellular fluid flow and chemical species transport around and within porous bioactive glass.
AUTHOR: Garcia A J; Ducheyne P
CORPORATE SOURCE: Department of Bioengineering, University of Pennsylvania, Philadelphia 19104.
SOURCE: JOURNAL OF BIOMEDICAL MATERIALS RESEARCH, (1994 Aug) 28 (8) 947-60.
Journal code: HJJ. ISSN: 0021-9304.
PUB. COUNTRY: United States
Journal; Article; (JOURNAL ARTICLE)
LANGUAGE: English
FILE SEGMENT: Priority Journals
ENTRY MONTH: 199503

AB Modeling of the physical phenomena present at the biomaterial-tissue interface provides a valuable tool for examining the underlying mechanisms which influence the overall behavior of the implant-host system. Based on histological data from a previous implantation study (E. Schepers, M. De Clercq, **P**. Ducheyne, and R. Kempeneers, "**Bioactive glass** particulate materials as a filler for bone lesions," J. Oral Rehab.; 18, 439-452, 1991, Ref. 1) which documented the differentiation of mesenchymal cells to cells expressing the osteoblastic phenotype in porous **bioactive glass**, a finite element momentum and mass transport model was constructed. In this analysis, the extracellular compositional variations and fluid flow conditions around and within porous **bioactive glass** granules were determined. Numerical simulations demonstrated that the interstitial fluid flow around these granules (300-360 microns) is viscosity dominated (low Reynolds number flow) and that the fluid inside the granules remains stagnant. This velocity field results in shear stresses proportional to the velocity gradient at the granule-fluid interface outside the **particles** and no shear stresses inside the **particles**. A parametric study on the effect of interstitial fluid flow on chemical species (**Na**+, **Ca**+2, HPO(4)-2) transport outside the granules revealed three domains. At low velocities (0-0.1 micron/s), the transport of species is diffusion controlled. At intermediate velocities (1.0-10 microns/s), diffusion and convection contribute to the species transport. The concentration of chemical species is nearly uniform at high velocities (100-800 microns/s). For all three cases, the transport of chemical species within the granules is diffusion controlled. The differences in transport mechanisms and interstitial fluid flow conditions lead to variations in concentrations, reaction rates, and shear stresses between the inside and the outside of the glass granules. These differences may influence cellular migration, attachment, differentiation, and the overall response to these bioactive materials.

L11 ANSWER 11 OF 20 MEDLINE
ACCESSION NUMBER: 94064687 MEDLINE
DOCUMENT NUMBER: 94064687
TITLE: Dissolution and scanning electron microscopic studies of

Ca,P particle-containing bioactive glasses.

AUTHOR: Kangasniemi I M; Vedel E; de Blick-Hogerworst J; Yli-Urpo A
U; de Groot K
CORPORATE SOURCE: Biomaterials Research Group, University of Leiden, The Netherlands..

SOURCE: JOURNAL OF BIOMEDICAL MATERIALS RESEARCH, (1993 Oct) 27 (10) 1225-33.
Journal code: HJJ. ISSN: 0021-9304.
PUB. COUNTRY: United States
Journal; Article; (JOURNAL ARTICLE)
LANGUAGE: English
FILE SEGMENT: Priority Journals
ENTRY MONTH: 199403

AB **Calcium** phosphate (**Ca,P**) precipitation behavior on the surface of two bioactive glasses and four **bioactive glass** composites--two with hydroxylapatite (Ca10(PO4)6 (OH)2) and two with rhenanite (CaNaPO4)--were studied in simulated body fluid (SBF) and in Tris-Buffer at 5, 8, 16, 24, 48, 72, and 144 h. The weight loss of the materials was measured and the amount of precipitation was estimated using scanning electron microscopy with electrochemical detection (SEM-EDX) analysis. The test was repeated for one glass and its respective rhenanite composite every 3 h until 60 h and thereafter every 10 h until 150 h in SBF. Atomic absorption spectroscopy, spectrophotometry, SEM-EDX analysis, and pH measurements were performed on these samples. It is shown that in vitro the composite materials have a higher capacity for **Ca,P** precipitation than the glasses. Weight losses of the materials correlate well with their composition. Both the glass and **Ca,P** phases influence the precipitation mechanism and rate. Precipitation begins preferably from the glass phase. **Ca,P particles** clearly influence the time of onset and rate of precipitation. Cross-sectional EDX analysis of the samples revealed an absence of a clear Si-rich layer in glass A0B0 (SiO2 53.9 mol %, Na2O 27.5, CaO 12.4, P2O5 6.2, Al2O3 0.0 and B2O3 0.0) composites. This was attributed to the presence of extra **calcium** and phosphate ions on the surface of the material. The ion-concentration and pH change curves offered insight into the mechanism of precipitation. A connection was established between SEM-EDX results and the release curves. Formation of an Si,**Ca,Na** film was observed that seemed to initiate the **Ca,P** precipitation.(ABSTRACT TRUNCATED AT 250 WORDS)

=> d l11 ibib abs 12-20

L11 ANSWER 12 OF 20 MEDLINE
ACCESSION NUMBER: 92381088 MEDLINE
DOCUMENT NUMBER: 92381088
TITLE: Preparation of dense hydroxylapatite or rhenanite containing bioactive glass composites.
AUTHOR: Kangasniemi I M; de Groot K; Becht J G; Yli-Urpo A
CORPORATE SOURCE: Department of Biomaterials, University of Leiden, The

Netherlands..
SOURCE: JOURNAL OF BIOMEDICAL MATERIALS RESEARCH, (1992 May) 26 (5) 663-74.
Journal code: HJJ. ISSN: 0021-9304.
PUB. COUNTRY: United States
Journal; Article; (JOURNAL ARTICLE)
LANGUAGE: English
FILE SEGMENT: Priority Journals
ENTRY MONTH: 199212

AB The effect of time at 600 degrees C and of small additions of Al2O3 and B2O3 on the sintering of two composite materials of (1) hydroxylapatite (Ca10(PO4)6(OH)2) and **bioactive glass** (SiO2-CaO-P2O5-Na2O) or (2) rhenanite (CaNaPO4) and **bioactive glass** were studied. Scanning microscopy, quantitative EDX, x-ray diffraction, helium gas density measurements, and diametral measurements were performed on the resulting composites. No reactions were observed with the SEM or XRD between the hydroxylapatite **particles** and the glass matrix within sufficient sintering times to achieve maximum density. The rheunanite-containing composites were observed to form Na2O2CaO3SiO2 crystals by x-ray diffraction, probably as a result of dissolution of the rhenanite **particle** surfaces into the glass phase, the crystals formed in the glass or at the interface of the glass, and the ceramic **particles**. However, within the short sintering times needed to achieve maximum density the rhenanite **particles** remained mostly intact. The rhenanite-containing materials gave better results than the hydroxylapatite-containing materials. The glass composition had a great effect on the densification process.

L11 ANSWER 13 OF 20 MEDLINE

ACCESSION NUMBER: 92194035 MEDLINE
DOCUMENT NUMBER: 92194035
TITLE: Bioactive glass particulate material as a filler for bone lesions.
AUTHOR: Schepers E; de Clercq M; Ducheyne P; Kempeneers R
CORPORATE SOURCE: Department of Prosthetic Dentistry, Catholic University of Leuven, Belgium.
SOURCE: JOURNAL OF ORAL REHABILITATION, (1991 Sep) 18 (5) 439-52.
Journal code: JIE. ISSN: 0305-182X.
PUB. COUNTRY: ENGLAND: United Kingdom
Journal; Article; (JOURNAL ARTICLE)
LANGUAGE: English
FILE SEGMENT: Priority Journals; Dental Journals
ENTRY MONTH: 199206

AB **Calcium**-phosphate ceramic particulates are often used as filler material for enhanced repair of dental bone defects. Although evidence of bone ingrowth in the scaffold of these **particles** has been described, it is not observed consistently. Fibrous tissue often encapsulates these **particles**, which can subsequently become dispersed into the surrounding tissues or even exfoliated. The aim of the present study was to evaluate **bioactive glass** granules (Biogran) as a filler for osseous lesions, and to compare them with two commercially available Hydroxylapatite (HA) granules. The particulates were implanted in the jaws of five beagle dogs, resected and evaluated after 1, 2, 3, 6 and 12 months of implantation. Histological analysis revealed an improvement in repair of all the lesions. A massive osteoconductive bone growth was seen near the walls of the bony cavities, but in greater amounts around the **bioactive glass**

granules than around the HA materials. On top of this massive growth a trabecular bone growth was observed in the centre of the bony cavities. These trabeculae were associated with the glass **particles**, which exhibited osteophilic properties, while fibrous tissue separated the bone tissue from the HA **particles**. The centres of many of the **particles** are excavated, and are subsequently filled by newly formed bone tissue. This internally formed bone tissue is not necessarily connected to the surrounding bone tissue, and functions as a nucleation site for further bone repair. For the mesenchymal cells within the eroded glass **particles** this inner environment acts as a stimulus to differentiate into osteoblasts and to start their osteogenetic potential. This phenomenon was not observed around the HA materials. If the latter were surrounded by fibrous tissue, disintegration of the surface by giant cells was observed.

L11 ANSWER 14 OF 20 EMBASE COPYRIGHT 2000 ELSEVIER SCI. B.V.
ACCESSION NUMBER: 2000191671 EMBASE
TITLE: Temporal zeta potential variations of 45S5 bioactive glass immersed in an electrolyte solution.
AUTHOR: Lu H.H.; Pollack S.R.; Ducheyne P.
CORPORATE SOURCE: H.H. Lu, Bioactive Mat./Tissue Engg. Ctr., Department of Bioengineering, University of Pennsylvania, 3320 Smith Walk, Philadelphia, PA 19104, United States.
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SOURCE: Journal of Biomedical Materials Research, (2000) 51/1 (80-87).
Refs: 37
ISSN: 0021-9304 CODEN: JBMRBG
COUNTRY: United States
DOCUMENT TYPE: Journal; Article
FILE SEGMENT: 027 Biophysics, Bioengineering and Medical Instrumentation
LANGUAGE: English
SUMMARY LANGUAGE: English
AB 45S5 **bioactive glass** (BG) is a bioactive material known to bond to bone in vivo through a surface **calcium** phosphate (**Ca-P**) layer. The goal of this study was to address the importance of BG surface charge in the bioactive response by examining the relationship between charge variations and the formation of the surface **Ca-P** layer. The zeta potential of BG in an electrolyte solution (TE) was measured by **particle** electrophoresis, and the formation of a **Ca-P** layer was characterized using SEM, EDXA, and FTIR. Si, **Ca**, and **P** solution concentrations also were determined. The initial BG surface was negatively charged, and two sign reversals were detected during 3 clays of immersion. The first, from negative to positive after 1 day, is attributed to the adsorption of cations at the BG surface, and the second reversal was due to the precipitation of phosphate ions from solution. A strong correlation was found between the formation of a **Ca-P** layer and BG surface zeta potential variations. The dynamic shift in zeta potential from an initially negative surface to a positively charged surface directly corresponded with the formation of an amorphous **Ca-P** layer. In addition, when the glass surface matured into a crystalline **Ca-P** layer, it was associated with a reversal from a positive to a negative surface. Future work will focus on the effects of protein adsorption on BG surface charge and **Ca-P** layer formation kinetics as well as on cellular response to a

changing BG surface. (C) 2000 John Wiley and Sons, Inc.

L11 ANSWER 15 OF 20 EMBASE COPYRIGHT 2000 ELSEVIER SCI. B.V.
ACCESSION NUMBER: 2000103640 EMBASE
TITLE: Assessment of resorbable bioactive material for grafting of critical- size cancellous defects.
AUTHOR: Wheeler D.L.; Eschbach E.J.; Hoellrich R.G.; Montfort M.J.; Chamberland D.L.
CORPORATE SOURCE: D.L. Wheeler, Department of Orthopaedics, University of Florida, Box 100246, 1600 S.W. Archer Road, Gainesville, FL 32610, United States. wheelerd@ortho.ufl.edu
SOURCE: Journal of Orthopaedic Research, (2000) 18/1 (140-148). Refs: 44
ISSN: 0736-0266 CODEN: JOREDR
COUNTRY: United States
DOCUMENT TYPE: Journal; Article
FILE SEGMENT: 033 Orthopedic Surgery
LANGUAGE: English
SUMMARY LANGUAGE: English
AB Bioactive glasses form a surface apatite layer in vivo that enhances the formation and attachment of bone. Sol-gel Bioglass graft material provides greater nanoscale porosity than **bioactive glass** (on the order of 50-200 .ANG.), greater **particle** surface area, and improved resorbability, while maintaining bioactivity. This study histologically and biomechanically evaluated, in a rabbit model, bone formed within critical-sized distal femoral cancellous bone defects filled with 45S5 Bioglass particulates, 77S sol-gel Bioglass, or 58S sol-gel Bioglass and compared the bone in these defects with normal, intact, untreated cancellous bone and with unfilled defects at 4, 8, and 12 weeks. All grafted defects had more bone within the area than did unfilled controls ($p < 0.05$). The percentage of bone within the defect was significantly greater for the 45S5 material than for the 58S or 77S material at 4 and 8 weeks ($p < 0.05$), yet by 12 weeks equivalent amounts of bone were observed for all materials. By 12 weeks, all grafted defects were equivalent to the normal untreated bone. The resorption of 77S and 58S **particles** was significantly greater than that of 45S5 **particles** ($p < 0.05$). Mechanically, the grafted defects had compressive stiffness equivalent to that of normal bone at 4 and 8 weeks. At 12 weeks, 45S5-grafted defects had significantly greater stiffness ($p < 0.05$). At 8 and 12 weeks, all grafted defects had significantly greater stiffness than unfilled control defects ($p < 0.05$). In general, the 45S5-filled defects exhibited greater early bone ingrowth than did those filled with 58S or 77S. However, by 12 weeks, the bone ingrowth in each defect was equivalent to each other and to normal bone. The 58S and 77S materials resorbed faster than the 45S5 materials. Mechanically, the compressive characteristics of all grafted defects were equivalent or greater than those of normal bone at all time points.

L11 ANSWER 16 OF 20 EMBASE COPYRIGHT 2000 ELSEVIER SCI. B.V.
ACCESSION NUMBER: 1999413822 EMBASE
TITLE: In vitro transformation of bioactive glass granules into **Ca-P** shells.
AUTHOR: Radin S.; Ducheyne P.; Falaize S.; Hammond A.

CORPORATE SOURCE: P. Ducheyne, University of Pennsylvania, Bioactive Mat./Tissue Engg. Ctr., Department of Bioengineering, 3320 Smith Walk, Philadelphia, PA 19104, United States
SOURCE: Journal of Biomedical Materials Research, (2000) 49/2 (264-272).
Refs: 21
ISSN: 0021-9304 CODEN: JBMRBG
COUNTRY: United States
DOCUMENT TYPE: Journal; Article
FILE SEGMENT: 027 Biophysics, Bioengineering and Medical Instrumentation
LANGUAGE: English
SUMMARY LANGUAGE: English
AB **Bioactive glass** (BG) granules of narrow size are excavated when implanted in mandibular bone of beagles. Bone tissue forms within these internally hollowed **particles** without a connection to the bone at the margins of the defect. In this study the internal excavation of BG granules was simulated by in vitro immersion experiments.

Postimmersion solutions were analyzed for changes in Si, **Ca**, and **P** concentrations. Using scanning electron microscopy (SEM), energy dispersive X-ray (EDX) analysis and Fourier Transform Infrared (FTIR) spectroscopy, granules were analyzed for compositional, morphologic, and structural changes resulting from immersion. Only when the solution was continuously replenished and only if this solution was composed of electrolyte- and protein-containing serum was excavation achieved. Without solution replenishment, that is, under so-called integral immersion conditions, the solution quickly became saturated in silicon, and the silicon no longer dissolved. When the glass was immersed in a solution with serum, a porous surface structure with fine precipitates was formed, in contrast to a dense surface reaction layer with closely packed globular precipitates that was formed in a solution without serum. The combined effect of continuous solution replenishment and the use of a solution containing serum proteins led to the formation of a surface reaction layer that did not impede continued corrosion. As such, all Si was released, and eventually a hollow **Ca-P** shell was formed. Thus this study supports the hypothesis that there is a physico-chemical mechanism of Si transport through the **Ca-P**-rich layer followed by Si dissolution. This mechanism may be operative in vivo and thereby may contribute to the observed in vivo excavation.

L11 ANSWER 17 OF 20 EMBASE
ACCESSION NUMBER: 1998301454 EMBASE
TITLE: Ultrasonic implantation of **calcium** metasilicate glass particles into PMMA.
AUTHOR: Tsuru K.; Hayakawa S.; Ohtsuki C.; Osaka A.
CORPORATE SOURCE: A. Osaka, Biomaterials Laboratory, Faculty of Engineering, Okayama University, Tsushima, Okayama-shi 700, Japan
SOURCE: Journal of Materials Science: Materials in Medicine, (1998)
9/8 (479-484).
Refs: 20
ISSN: 0957-4530 CODEN: JSMMEL
COUNTRY: United Kingdom

DOCUMENT TYPE: Journal; Article
FILE SEGMENT: 027 Biophysics, Bioengineering and Medical Instrumentation
LANGUAGE: English
SUMMARY LANGUAGE: English

AB Polymer materials for clinical applications should be bioactive and have a bone-bonding ability. In order to provide poly(methyl methacrylate) (PMMA) with bioactivity, granules (< 45 .mu.m) of a **bioactive glass** 50CaO.50SiO2 (mol %) were implanted into PMMA: they were suspended together with a piece of PMMA in a 40 tetrahydrofuran-60 ethanol (vol %) solution and ultrasonically agitated. The granules of < 10 .mu.m in size were impregnated at .apprx. 40-20 .mu.m depth below the substrate surface. Two types were detected on the PMMA surface: (a) a glass-granule layer on PMMA, and (b) an inner granule layer, a PMMA layer, and an outer granule layer on the PMMA. The bioactivity of the implanted PMMA substrates was examined in vitro with a simulated body fluid (Kokubo solution). Apatite was precipitated on all glass granules and the whole substrate surfaces within 1 d. After 4 h soaking in the Kokubo solution, aggregates of apatite **particles** appeared on the substrate surface, independently of those on the glass granules, and they grew and proliferated on the whole subtrate surface in 7 d. Silica gel islands on PMMA due to the silicate anions from the glass were considered to induce nucleation of the apatite **particles**.

L11 ANSWER 18 OF 20 EMBASE COPYRIGHT 2000 ELSEVIER SCI. B.V.
ACCESSION NUMBER: 1998257980 EMBASE
TITLE: Effect of **bioactive glass** **particle** size on osseous regeneration of cancellous defects.
AUTHOR: Wheeler D.L.; Stokes K.E.; Hoellrich R.G.; Chamberland D.L.; McLoughlin S.W.
CORPORATE SOURCE: D.L. Wheeler, University of Florida, Orthopaedics/Orthopaedic Res. Dept., P.O. Box 100246, Gainesville, FL 32610-0246, United States
SOURCE: Journal of Biomedical Materials Research, (15 Sep 1998) 41/4 (527-533).
Refs: 15
ISSN: 0021-9304 CODEN: JBMRBG
COUNTRY: United States
DOCUMENT TYPE: Journal; Conference Article
FILE SEGMENT: 027 Biophysics, Bioengineering and Medical Instrumentation
033 Orthopedic Surgery
LANGUAGE: English
SUMMARY LANGUAGE: English

AB The **bioactive glass** known as Bioglass.RTM. or Perioglass.RTM. (USB) (US Biomaterials, Alachua, FL) has proven to be an effective graft material owing to the apatite layer which forms on the surface of the glass, promoting bone formation. USB **particles** range in size from 90 to 710 .mu.m in diameter, as determined by optical microscopy. A similar bioactive material, BioGran (OV) (Orthovita, Malvern, PA), was developed to limit the **particle** size of 45S5 to the range between 300 and 360 .mu.m, as determined by sieving. The objective of this study was to histologically and biomechanically compare the 45S5 **bioactive glass**, produced by US Biomaterials, in a wide **particle** range (USB) to the narrower **particle**

range glass produced by Orthovita (OV). The grafted defects will then be compared to normal cancellous bone (NORM) of the distal femur in rabbits. Histologically, more bone was quantified at both 4 and 12 weeks within the defects filled with USB and NORM when compared to the limbs filled with OV ($p < 0.05$). The OV **particles** had greater **particle** axes and larger **particle** areas on average than the USB **particles** ($p < 0.05$). However, the **particle** axis and area of the two materials decreased with time at a similar rate. Biomechanically, the USB- and OV-grafted defects had comparable peak compressive load, compressive stiffness, and compressive modulus which were equivalent to normal bone.

L11 ANSWER 19 OF 20 EMBASE COPYRIGHT 2000 ELSEVIER SCI. B.V.
ACCESSION NUMBER: 94370125 EMBASE
DOCUMENT NUMBER: 1994370125
TITLE: Bioactive glass-ceramic containing crystalline apatite and wollastonite initiates biomineralization in bone cell cultures.
AUTHOR: Sautier J.M.; Kokubo T.; Ohtsuki T.; Nefussi J.R.; Boulekbache H.; Oboeuf M.; Loty S.; Loty C.; Forest N.
CORPORATE SOURCE: Laboratoire de Biologie-Odontologie, Institut Biomedical des Cordeliers, 15-21, rue de l'Ecole de Medecine,F-75270 Paris Cedex 06, France
SOURCE: Calcified Tissue International, (1994) 55/6 (458-466). ISSN: 0171-967X CODEN: CTINDZ
COUNTRY: United States
DOCUMENT TYPE: Journal; Article
FILE SEGMENT: 001 Anatomy, Anthropology, Embryology and Histology
LANGUAGE: English
SUMMARY LANGUAGE: English
AB Rat bone cells were cultured in the presence of **bioactive glass**-ceramic containing crystalline apatite and wollastonite. Scanning electron microscopy observations of the surface of the seeded ceramic disks revealed that cells attached, spread, and proliferated on the material surface. Soaking in cell- free culture medium showed that no change occurred in the surface structure. However, when cultured with bone cells and observed under a transmission electron microscope, an electron-dense layer was noted initially at the surface of the material, before bone formation occurred. In addition, energy- dispersive X-ray microanalysis demonstrated the presence of **calcium** and phosphorus in this layer. Progressively, during the following days of culture, active osteoblasts synthetized and laid down an osteoid matrix composed of numerous collagen fibrils arranged either parallel or perpendicularly to the first-formed electron-dense layer. Mineralization initiated on the ceramic surface dispersed then along the collagenous fibrils, leading to a mineralized matrix which surrounded the ceramic **particles**. These results demonstrate the capacity of apatite-wollastonite glass ceramic to initiate biomineralization in osteoblast cultures and to achieve a direct bond between the surface apatite layer of the **bioactive glass**-ceramic and the mineralized bone matrix.

L11 ANSWER 20 OF 20 EMBASE COPYRIGHT 2000 ELSEVIER SCI. B.V.
ACCESSION NUMBER: 94233040 EMBASE
DOCUMENT NUMBER: 1994233040
TITLE: Numerical analysis of extracellular fluid flow and chemical

species transport around and within porous bioactive glass.
AUTHOR: Garcia A.J.; Ducheyne P.
CORPORATE SOURCE: Department of Bioengineering, University of Pennsylvania, 220 S. 33rd Street,Philadelphia, PA 19104, United States
SOURCE: Journal of Biomedical Materials Research, (1994) 28/8 (947-960).
ISSN: 0021-9304 CODEN: JBMRBG
COUNTRY: United States
DOCUMENT TYPE: Journal; Conference Article
FILE SEGMENT: 027 Biophysics, Bioengineering and Medical Instrumentation
LANGUAGE: English
SUMMARY LANGUAGE: English

AB Modeling of the physical phenomena present at the biomaterial tissue interface provides a valuable tool for examining the underlying mechanisms which influence the overall behavior of the implant-host system. Based on histological data from a previous implantation study (E. Schepers, M. De Clercq, **P.** Ducheyne, and R. Kempeneers, '**Bioactive glass** particulate materials as a filler for bone lesions.' J. Oral Rehab.; 18, 439-452, 1991, Ref. 1) which documented the differentiation of mesenchymal cells to cells expressing the osteoblastic phenotype in porous **bioactive glass**, a finite element momentum and mass transport model was constructed. In this analysis, the extracellular compositional variations and fluid flow conditions around and within porous **bioactive glass** granules were determined. Numerical simulations demonstrated that the interstitial fluid flow around these granules (300-360 .mu.m) is viscosity dominated (low Reynolds number flow) and that the fluid inside the granules remains stagnant. This velocity field results in shear stresses proportional to the velocity gradient at the granule-fluid interface outside the **particles** and no shear stresses inside the **particles**. A parametric study on the effect of interstitial fluid flow on chemical species (**Na**+, **Ca**+2, HPO4-2) transport outside the granules revealed three domains. At low velocities (0-0.1 .mu.m/s), the transport of species is diffusion controlled. At intermediate velocities (1.0-10 .mu.m/s), diffusion and convection contribute to the species transport. The concentration of chemical species is nearly uniform at high velocities (100- 800 .mu.m/s). For all three cases, the transport of chemical species within the granules is diffusion controlled. The differences in transport mechanisms and interstitial fluid flow conditions lead to variations in concentrations, reaction rates, and shear stresses between the inside and the outside of the glass granules. These differences may influence cellular migration, attachment, differentiation, and the overall response to these bioactive materials.

=> d his

(FILE 'HOME' ENTERED AT 13:40:23 ON 14 JUL 2000)

FILE 'CA' ENTERED AT 13:40:26 ON 14 JUL 2000

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L1             2 S (NON-INTERLINK?) OR (NON INTERLINK?) OR (NONINTERLINK?)
L2           560 S BIOACTIVE GLASS
L3            17 S PARTICULATE AND L2
L4            11 S PARTICULATE (S) L2

     FILE 'MEDLINE, EMBASE' ENTERED AT 13:47:11 ON 14 JUL 2000
L5             0 S (NON-INTERLINK?) OR (NON INTERLINK?) OR (NONINTERLINK?)
L6         10961 S BIOACTIVE
L7           321 S BIOACTIVE GLASS
L8            40 S L7 (S) PARTICL?
L9             0 S L8 AND (NON-INTERLINK?)
L10            3 S L8 AND (DRESSING OR WOUND)
L11           20 S L8 AND (NA OR SODIUM OR CA OR CALCIUM OR P OR PHOSPHOURS)

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---Logging off of STN---


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Executing the logoff script...


=> LOG Y

STN INTERNATIONAL LOGOFF AT 13:50:28 ON 14 JUL 2000
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